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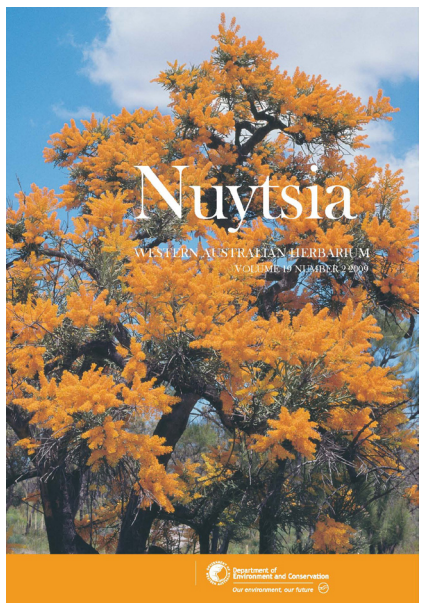

Thiele, K.R.

Three new species of *Hibbertia* (Dilleniaceae) from Western Australia

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Three new species of *Hibbertia* (Dilleniaceae) from Western Australia

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Abstract

Thiele, K.R. Three new species of *Hibbertia* (Dilleniaceae) from Western Australia. *Nuytsia* 19(2): 283–293 (2009). Three new species, *Hibbertia leucocrossa* K.R.Thiele, *H. fasciculiflora* K.R.Thiele and *H. propinqua* K.R.Thiele are described as new. All taxa occur north of Perth in the Lesueur Sandplains subregion of the Geraldton Sandplains bioregion in the South West Botanical Province, Western Australia. A revision of a key to the *Hibbertia* species of Western Australia is provided.

Introduction

Hibbertia Andrews comprises *c.* 112 taxa in Western Australia. The great majority of species occur in the South West Botanical Province, with smaller numbers in the Eremaean and Northern Botanical Provinces.

Traditionally, *Hibbertia* has been divided into up to seven sections, principally on the basis of androecial arrangement, particularly the symmetry of the androecium, freedom or connation of staminal filaments, and presence or absence and distribution of staminodes. Horn (2005), following a molecular phylogenetic analysis based on nuclear and chloroplast genomes, demonstrated that these prior classifications are poor representations of phylogeny. He divided *Hibbertia* into two well-supported subgenera, subgen. *Hemistemma* (Thouars) Horn and subgen. *Hibbertia* (Horn, 2009). All taxa in subgen. *Hibbertia* have an actinomorphic androecium (i.e. with stamens arranged all around the carpels), but subgen. *Hemistemma* includes clades with varied androecial arrangements including both actinomorphy and zygomorphy (i.e. with stamens all on one side of the carpels); these conditions appear to have arisen several times independently. Taxa which have stamens fused into bundles comprise a single, well-supported clade within subgen. *Hibbertia*.

In addition to staminal arrangements, Horn (2005, 2009) showed that leaf morphology and indumentum are also phylogenetically informative. All taxa with ericoid, needle-like leaves in which the leaf margin is consistently strongly revolute to the midrib, thus hiding the undersurface, are in subgenus *Hemistemma*. In contrast, subgen. *Hibbertia* mostly comprises taxa with leaves that have flat or slightly recurved margins that leave the undersurface exposed.

The most recent complete revision of *Hibbertia* was that of Bentham (1863). A number of eastern Australian species complexes have been revised by Toelken (1995, 1998, 2000). Wheeler (2002a,b,c,d; 2004a,b) has described many new taxa from Western Australia, while Wheeler (2004c) provided a key to all Western Australian taxa known at that time.

A number of potentially new Western Australian taxa within *Hibbertia* are currently known only by phrase names, mostly recognised by Wheeler while curating material at the Western Australian Herbarium. The present paper formally describes taxa segregated by Wheeler under the phrase names *H*. sp. Tathra (M.A. Langley & J.M. Harvey 1873) and *H.* sp. Warradarge (M. Hislop 1933). Close investigation of the former taxon for this paper showed that it comprises two closely related taxa. All taxa in this paper occur north of Perth between Eneabba and the Moore River, in the Lesueur Sandplains subregion of the Geraldton Sandplains bioregion in the South West Botanical Province.

Taxonomy

Hibbertia leucocrossa K.R.Thiele, *sp. nov.*

Hibbertiae desmophyllae affinis sed foliis dispersis grandioribus glabrescentiis, sepalis ciliatis differt.

Typus: junction of Brand Highway and Coorow – Green Head Road East, Western Australia, 30° 03' 21" S, 115° 19' 47" E, 1 December 2008, *K.R. Thiele* 3705 (*holo*: PERTH 08034893; *iso*: AD, CANB, K).

Hibbertia sp. Warradarge (M. Hislop 1933), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed October 2009].

Spreading to ± erect, multi-stemmed *shrub* to 30(–50) cm high, abundantly suckering from the rootstock, with papery bark exfoliating in narrow strips; young stems ± cylindrical, cobwebbed with dense, white, appressed to ± spreading, curled to crisped, simple hairs; older stems glabrescent. *Leaves* erect to spreading, scattered, sessile, green or glaucous, narrowly obovate often appearing linear, 20–30(–40) mm long, (0.8–)2–3(–4) mm wide, sparsely hairy with simple, white, curled or crisped hairs on both surfaces when young soon becoming glabrous except for a fringe of white, marginal hairs at the base; margins narrowly revolute, not obscuring the abaxial surface in broad leaves, meeting below and obscuring both the abaxial surface and the midrib in narrow leaves particularly when dry; base slightly expanded but not stem-clasping; apex obtuse, rarely subacute, straight. *Flowers* solitary, sparse, terminating branches and short lateral shoots, ± sessile; *primary bract* scarious, narrowly triangular-acuminate, 3–4 mm long, *c*. 1 mm broad, acute, glabrous to sparsely pilose adaxially and abaxially, long-ciliate on the margin, ± basal on the peduncle (if present); *accessory bracts* absent. *Sepals* 5; outer sepals ovate, attenuate and thickened at the apex but not pungent, (6–)8–9(–10) mm long, ± glabrous to moderately pubescent with appressed to ± spreading, curled to crisped, white, simple hairs denser on the margins and forming a ciliate fringe; midrib ribbed but not prominently so; inner sepals similar to the outer but with sparser indumentum. *Petals* 5, yellow, obovate, 10–12 mm long, emarginate. *Stamens* 15–21, in 5 bundles each with 2–6 connate stamens (sometimes with one stamen in the bundle not connate); filaments *c*. 2 mm long; anthers oblong-obovoid, 1.5–2.0 mm long, dehiscing by longitudinal slits; staminodes absent. *Carpels* 3, compressed-globular, glabrous; styles lateral at apex and spreading, *c*. 2.5–3.0 mm long. *Ovule* 1 per carpel. *Fruiting carpels* not seen. (Figure 1)

Figure 1. Holotype of *Hibbertia leucocrossa*. Scale bar = 5 cm.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: layby off Brand Highway, 4 km S of Green Head turnoff, 27 May 1997, *R. Davis* 3224; Hill [?] km NE of Mount Lesueur, NE of Jurien, 17 Nov. 1979, *E.A. Griffin* 2530; Brand Hwy, near low voltage powerline, N of Tootbardi Rd, NE of Jurien, 1 Dec. 1992, *E.A. Griffin* 8007; E side Banovich Rd 1200 m from junction with Jurien East Rd, 8 Feb. 2006, *M. Hayes* 461; in large block of renmnant vegetation in private farmland (Breakaway, J. & J. Browne) off Green Head–Coorow road, *c*. 3 km W of Brand Highway, 28 Oct. 1995, *M. Hislop* 222; large block of remnant vegetation (SE boundary) on private farmland (Breakaway, J. & J. Browne) adjacent Brand Highway, *c*. 2 km S of junction of Coorow–Green Head road, 29 June 1997, *M. Hislop* 783; Hi Vallee property (D. & J. Williams), Warradarge, above NW head of main valley, 23 Oct. 1999, *M. Hislop* 1747; Hi Vallee property (D. & J. Williams), Warradarge, upland to N of main valley, 6 Dec. 1999, *M. Hislop* 1933; *c.* 500 m S of Woolmulla Road on Grover Road, *c*. 36 km NNE of Jurien, 20 Jan. 1996, *B.J. Lepschi & T.R. Lally* 2453; near E border of Nambung National Park, region of Mullering Brook, 29 Nov. 1974, *R. Pullen* 9723.

Distribution. Occurs in the vicinity of Warradarge Hill, on the Gairdner Range and north-east of Green Head in the Geraldton Sandplains IBRA Bioregion (Department of the Environment, Water, Heritage and the Arts, 2008) (Figure 2).

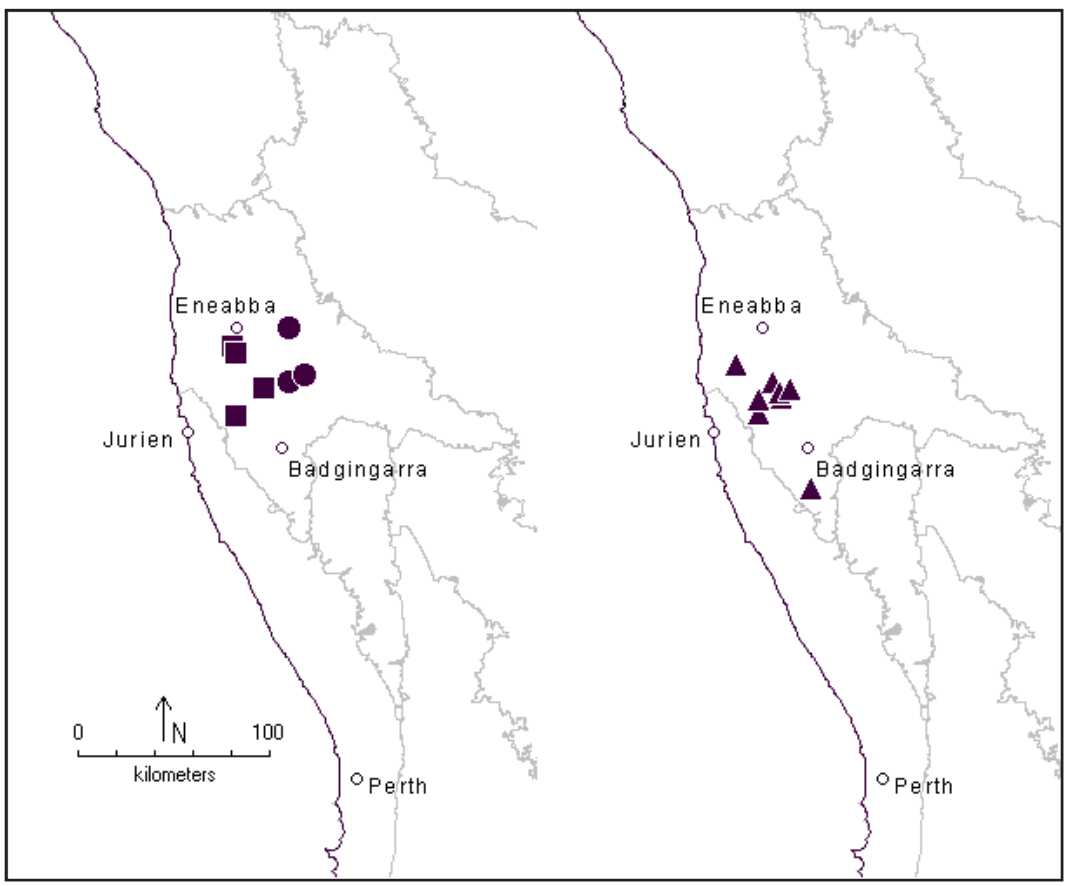

Figure 2. Distribution of *Hibbertia leucocrossa* (▲), *H. fasciculiflora* (●) and *H. propinqua* (■). Shaded lines show the boundaries of IBRA6.1 subregions (Department of the Environment, Water, Heritage and the Arts 2008); all specimens are within Geraldton Sandplains subregion GS2, the Lesueur Sandplain.

Habitat. Recorded from low, open woodland over heath, dominated by *Eucalyptus todtiana*, *E. gomphocephala*, and/or *Banksia* spp., on grey to white sand over laterite.

Phenology. Appears to flower sporadically throughout the year, probably in response to rainfall, with a peak in spring and summer (October to February).

Conservation status. Although of relatively restricted distribution (range *c.* 75 km × 20 km) the species appears to be common and occurs in several Nature Reserves and National Parks including Lesueur National Park and Coomallo Nature Reserve. The suckering/resprouting habit allows it to regrow quickly after disturbance, and it sometimes occurs abundantly along road verges where it is occasionally graded.

Etymology. From the Greek *leukos*, white, and *krossos*, a fringe, in reference to the distinctive fringe of white, cobwebby hairs at the leaf basal margins.

Affinities. The presence of connate staminal filaments places *Hibbertia leucocrossa* in subgen. *Hibbertia.* It appears to be closely related to *H. desmophylla* (Benth.) F.Muell., a species distributed from Kalbarri National Park to near the Moore River (and hence sympatric with it). *H. desmophylla* differs from *H. leucocrossa* in having generally smaller, more or less distinctly fascicled leaves which retain an indumentum of crisped, simple, white hairs to maturity, and sepals which lack a ciliate fringe. *Hibbertia leucocrossa* is also similar to an undescribed taxon known by the phrase name *H.* sp. Gnangara (J.R.Wheeler 2329), which differs in having distinctly fasciculate leaves which have a more persistent indumentum, abundantly pilose sepals, and broad, pale, papery bracts subtending the flowers.

Hibbertia fasciculiflora K.R. Thiele, *sp. nov.*

Species propria foliis ad extremitates surculorum valde fasciculatis, floribus e pedunculis longis glabris inter verticillum foliorum exorientiis.

Typus: Tathra National Park, *c*. 1.8 km south of the Eneabba – Carnamah Road, *c*. 200 m west of Garibaldi Road, Western Australia, 29° 49' 06" S, 115° 31' 16" E, 20 September 2008, *K.R. Thiele* 3689 (*holo*: PERTH 07915098; *iso*: AD, CANB, K).

Hibbertia sp. Tathra (M.A. Langley & J.M. Harvey 1873), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed October 2009], *p.p.*

Erect to spreading *shrubs* to 50 cm high, single-stemmed at base, the lower stems deeply fluted with papery bark exfoliating in flakes; young stems angular-winged below the leaf insertions, smooth, glabrous or sometimes with sparse, minute (*c.* 0.1 mm long), white, stellate hairs at first, soon glabrescent. *Leaves* spreading, borne in dense fascicles at the ends of growth units (with few or no leaves between the fascicles), indistinctly petiolate, green, linear to narrowly oblong, 12–20 mm long, (1.0–)1.5–2.0 mm wide; adaxial surface ± distinctly tuberculate, when young with sparse, spreading, hook-tipped hairs and minute stellate hairs arising from the tubercles, soon glabrescent; abaxial surface densely stellate-hairy (obscuring the surface), the midrib ± glabrous or with sparse, long, simple hairs; margins ± flat to recurved, often becoming revolute on drying and obscuring the abaxial leaf surface; base slightly expanded, adaxially finely and densely pubescent with short (0.1–0.3 mm), white, stellate hairs; apex straight-apiculate, non-pungent. *Flowers* borne amongst leaf-fascicles, distinctly slender-pedunculate, the peduncles 10–35 mm long, glabrous; *primary bract* borne immediately below the

flower, ± scarious, narrowly triangular to narrowly ovate, 4.0–5.5 mm long, 0.4–0.6 mm broad, acute, pilose adaxially and abaxially with long, spreading, stellate hairs; *accessory bracts* 4–8, similar in size, shape and indumentum to the primary bract, borne at the base of the peduncle amongst the leaf whorls. *Sepals* 5; outer sepals ovate, attenuate and thickened at the apex but not pungent, 5.0–6.5 mm long, firm-textured, pilose outside with long, spreading, simple, white hairs overlying minute stellate hairs, with hooked hairs towards the base, all hairs tubercle-based, shortly pubescent inside in the upper half; midrib prominent; inner sepals broader and shorter than the outer ones, less hairy and with a broad, ± glabrous, scarious margin. *Petals* 5, yellow, obovate, 8–12 mm long, emarginate. *Fertile stamens* 8–10, all on one side of the carpels; filaments, *c.* 1 mm long; anthers obloid, 1.5–2.0 mm long, dehiscing by short, longitudinal slits at the apex; staminodes present, usually 1–2 each side of the fertile stamens. *Carpels* 2, globular, densely pubescent; styles lateral, curved, *c*. 1.5 mm long. *Ovules* 2 per carpel. *Fruiting carpels* not seen. (Figure 3)

Other specimens examined (all PERTH). WESTERN AUSTRALIA: on vacant Crown Land, immediately S of Alexander Morrison National Park**,** 7 Sep. 1979, *E.A. Griffin* 2198; quadrat WM 017, Tathra National Park, 1.8 km S of Eneabba–Carnamah Road, 175 m W of Garibaldi Road, W of second firebreak, Carnamah Shire, 15 Oct. 1998, *M.A. Langley & J.M. Harvey* 1874; quadrat WM 35, Alexander Morrison National Park, north western block, E of NW corner, 21 Oct. 1998, *M.A. Langley & J.M. Harvey* 1873; quadrat WMA35, Alexander Morrison National Park, A 29804, Shire of Coorow, Central block, northern boundary between Garibaldi –Willis and Chatfield Clarke Roads, 27 Sep. 1999, *M.A. Langley & P.M. Smith* MAL 2106; 25 km E of Eneabba along road to Winchester, Irwin district**,** 30 Sep. 1979, *J. Taylor, M.D. Crisp & R. Jackson* JT 984.

Distribution. Occurs between Tathra and Alexander Morrison National Parks, east and southeast of Eneabba in the Geraldton Sandplains IBRA Bioregion (Department of the Environment, Water, Heritage and the Arts, 2008). Its distribution is closely parapatric to *H. propinqua*, occurring immediately to the east of that species (Figure 2).

Habitat. Recorded from low, open *Eucalyptus* and *Banksia* woodlands and heath (kwongan), in pale grey to yellow sand and sandy loams, usually over laterite or close to laterite breakaways.

Phenology. All flowering specimens have been collected in September.

Conservation status. Although of relatively restricted distribution (range *c.* 30 km × 10 km) the species appears to be relatively common and occurs in two National Parks (Tathra and Alexander Morrison).

Etymology. From the Latin *fasciculus*, a bundle, and *flos*, a flower, in reference to the flowers borne amongst distinctive leaf-fascicles.

Notes. The growth form of this species, with all leaves restricted to dense, fasciculate clusters (through the contraction of distal internodes) terminating seasonal growth units and from which the long flowering peduncles and next season's shoots arise, is distinctive. The peduncles are slender, glabrous and often somewhat curved, and persist on older shoots after the flowers have fallen.

Hibbertia fasciculiflora appears very closely related to *H. propinqua*, from which it differs in its glabrous stems and peduncles, more distinctly fasciculate leaves and flowers, and densely stellate-pubescent abaxial leaf surfaces.

Figure 3. Holotype of *Hibbertia fasciculiflora*. Scale bar = 5 cm.

Morphologically, *H. fasciculiflora* and *H. propinqua* appear closest to *H. diamesogenos* (Steud.) J.R.Wheeler and *H. hypericoides* (DC.) Benth., but these species have scattered leaves and flowers rather than distinctively fasciculate ones.

Hibbertia propinqua K.R. Thiele, *sp. nov.*

Hibbertiae fasciculiflorae affinis sed caulis juvenalis et pedunculis pubescentiis, pagina abaxiali foliorum sparse simplicipilosa differt.

Typus: Hi Vallee property (D. & J. Williams), Warradarge, *c.* one third of way along track east side of main valley, Western Australia, 30° 06' 19" S, 115° 24' 02" E, 25 August 2002, *M. Hislop* 2737 (*holo*: PERTH 06316727; *iso*: AD, MEL).

Hibbertia sp. Tathra (M.A. Langley & J.M. Harvey 1873), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed October 2009], *p.p.*

Hibbertia sp. South Eneabba (M. Hislop 2737), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed October 2009].

Erect to spreading *shrubs* to 50 cm high, single-stemmed at base, with papery bark exfoliating in flakes; young stems angular-winged below the leaf insertions, tuberculate, pubescent with minute (*c.* 0.1 mm long), white, tubercle-based stellate hairs overlain by longer (0.4–1.5 mm long), white, spreading, crisped, tubercle-based simple hairs (the latter absent on some plants), the hairs denser in the leaf axils; older stems with persistent, sparse indumentum to glabrescent. *Leaves* spreading, scattered along growth units and more crowded in fascicles at the ends of growth units, indistinctly petiolate, green, linear to narrowly oblong, 12–20 mm long, (1.0–)1.6–2.0(–2.5) mm wide; adaxial surface coarsely tuberculate, with spreading, hook-tipped to straight hairs arising from the tubercles, sometimes with few, minute, stellate hairs especially towards the base; abaxial surface with sparse, crisped, simple hairs overlying sparse, minute stellate hairs (the surface clearly visible), especially on and near the midrib; margins ± flat to recurved, often becoming revolute on drying and obscuring the abaxial leaf surface; base slightly expanded; apex recurved- (rarely straight-) apiculate, non-pungent. *Flowers* mostly borne amongst leaf-fascicles, pedunculate, the peduncles 8–16 mm long, pubescent to pilose with indumentum as for the stems; *primary bract* borne immediately below the flower, ± scarious, narrowly ovate, 4.0–5.5 mm long, 0.5–0.8 mm broad, acute, pilose adaxially and abaxially with spreading, simple hairs; *accessory bracts* 4–8, similar in size, shape and indumentum to the primary bract, usually borne at the base of the peduncle amongst the leaf whorls (rarely also midway along the peduncle). *Sepals* 5; outer sepals ovate, attenuate, 5.0–6.5 mm long, firm-textured, densely pilose outside with long, spreading, simple, white, tubercle-based hairs, pubescent inside in the upper half; midrib prominent; inner sepals broader and shorter than the outer ones, less hairy and with a broad, ± glabrous, scarious margin. *Petals* 5, yellow, obovate, 8–12 mm long, emarginate. *Fertile stamens* 8–10, all on one side of the carpels; filaments, *c.* 1 mm long; anthers obloid, 1.5–2.0 mm long, dehiscing by short, longitudinal slits at the apex; staminodes present, usually 1–2 each side of the fertile stamens. *Carpels* 2, globular, densely pubescent; styles lateral, curved, *c*. 1.5 mm long. *Ovules* 2 per carpel. *Fruiting carpels* not seen. (Figure 4)

Other specimens examined (all PERTH). WESTERN AUSTRALIA: Rocky Springs Reserve, 10 km S of Eneabba**,** 6 Sep. 1979, *E.A. Griffin* 2155; Mount Benia, E of Jurien; 16 Sep. 1979. *E.A. Griffin* 2253; Hi Vallee property (D. & J. Williams) Warradarge, below E breakaway, main valley**,** 13 Sep.

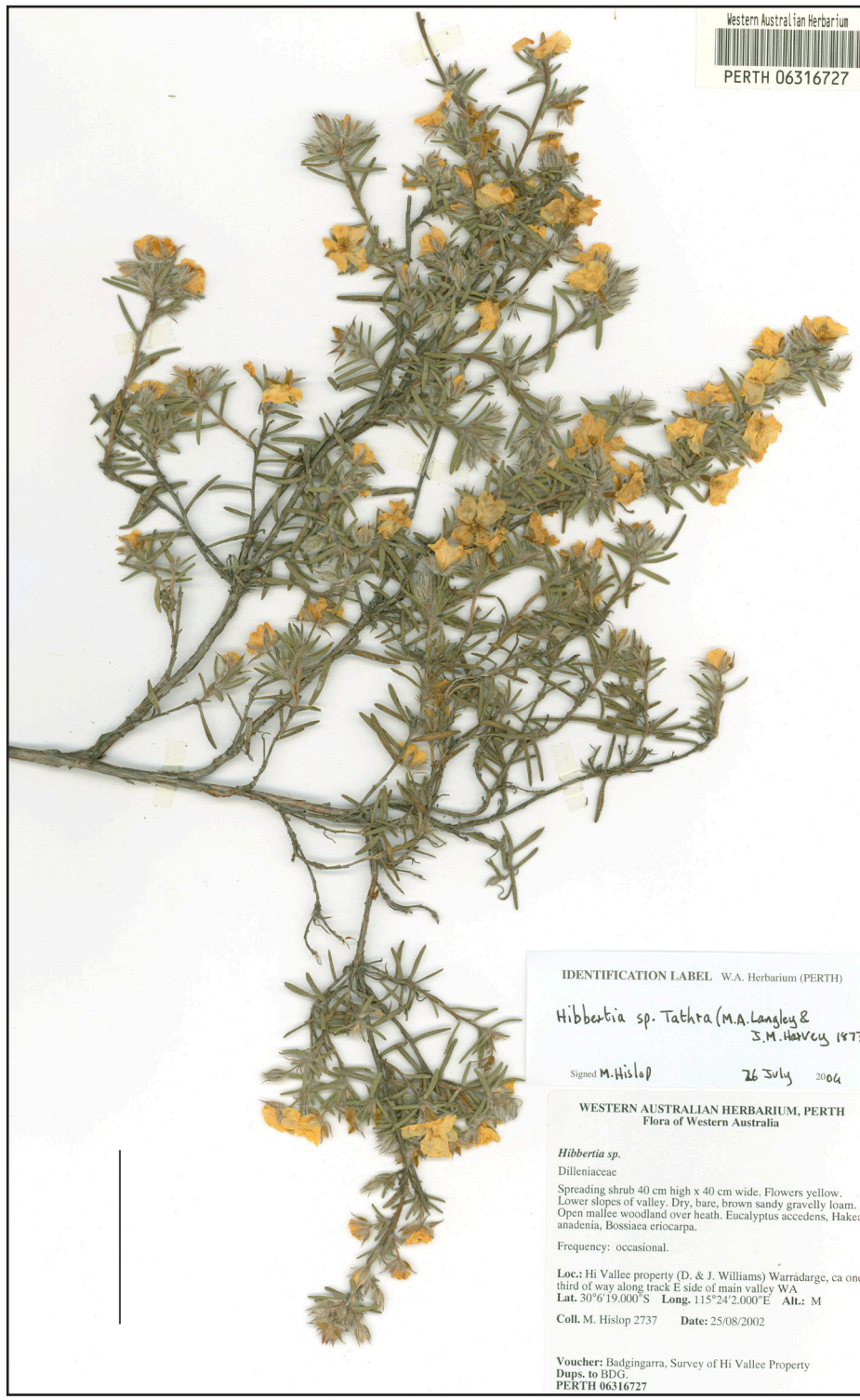

Figure 4. Holotype of *Hibbertia propinqua*. Scale bar = 5 cm.

1999, *M. Hislop* 1536; Hi Vallee property (D. & J. Williams), Warradarge, *c.* one third of way along track E side of main valley, 25 Aug. 2002, *M. Hislop* 2737; E side of the Brand Highway, 3.7 km S of junction with Rock Springs Road and *c*. 13.5 km S of Eneabba, 10 Sep. 1999, *J.W. Horn* 2377.

Distribution. Occurs between Eneabba and Mount Benia in the Geraldton Sandplains IBRA Bioregion (Department of the Environment, Water, Heritage and the Arts 2008). *Hibbertia propinqua* is closely parapatric to *H. fasciculiflora*, occurring immediately to the west of that species (Figure 2).

Habitat. Recorded from low, open *Eucalyptus* and *Banksia* woodlands and heath (kwongan), in pale grey to yellow sand and sandy loams, usually over laterite or close to laterite breakaways.

Phenology. All flowering specimens have been collected in August and September.

Conservation status. *Hibbertia propinqua* is listed as Priority Four under Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora (Atkins 2008) due to its restricted distribution (range *c*. 40 km x 15 km). However, it appears to be locally common; it is known to occur in South Eneabba Nature Reserve and has been collected close to Coomallo Nature Reserve, where it probably also occurs.

Etymology. From the Latin *propinquus* (near, neighbouring), in allusion to the morphological and geographic proximity of this species to the related *H. fasciculiflora*.

Notes. *Hibbertia propinqua* was previously included within the circumscription of *H.* sp. Tathra (M.A. Langley & J.M. Harvey 1873) along with *H. fasciculiflora*, and was only recognised as distinct during close examination for the preparation of this paper. It differs from *H. fasciculiflora* in having a less distinctively fasciculate-leaved habit with fewer flowers arising from each leaf-fascicle, pubescent young stems and peduncles, more prominently tuberculate leaves and sparsely simple-hairy abaxial leaf surfaces.

Morphologically, *H. fasciculiflora* and *H. propinqua* appear closest to *H. diamesogenos* and *H. hypericoides*, but these species have clearly scattered leaves and flowers rather than fasciculate ones.

Key to taxa

The key to Western Australian taxa of *Hibbertia* in Wheeler (2004c) should be amended as follows:

Hibbertia sp. Warradarge (couplet 106) should be replaced with *H. leucocrossa*. Couplet 28 should be replaced as follows:

28. Flower stalks single

29. Carpels 2-ovulate. Staminodes often present, 2 or 3 each side of the fertile stamens. Sepals glabrous or with simple, straight or uncinate hairs

30. Sepals glabrous or with a few appressed hairs. Bract below flower ovate to broadly ovate ..... **H. avonensis**

30. Sepals with uncinate and straight hairs. Bract below flower linear..... **H. diamesogenos**

29. Carpels 4-ovulate. Staminodes absent. Sepals with uncinate and stellate hairs ..... **H. ancistrotricha**

28. Flower stalks clustered arising from a cluster of leaves

28a. Young stems and peduncles +/- glabrous. Leaf abaxial surface (when visible) densely stellate-pubescent..... **H. fasciculiflora**

28a. Young stems and peduncles pubescent. Leaf abaxial surface (when visible) sparsely simple-pubescent over sparse, minute, stellate hairs ..... **H. propinqua**

Acknowledgements

Judy Wheeler first recognised and delimited two of the three taxa recognised in this paper in the collections of the Western Australian Herbarium, and I thank her and Mike Hislop for helpful discussions on these taxa. A duplicate of the type collection of *Hibbertia propinqua* was held in the private herbarium of Don and Joy Williams at Hi Vallee near Badgingarra, and I thank them for making this specimen available to add to the distributed type material. Kelly Shepherd provided valuable comments on the manuscript.

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